

Institute of Paper Science and Technology
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CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

Project 1108-17

Progress Report 67

to

FOURDRINIER KRAFT BOARD INSTITUTE, INC.

June 1, 1960

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

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THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

SUMMARY

The purpose of this study is to provide a continuous evaluation of the quality and runability of the corrugating mediums manufactured by members of the Fourdrinier Kraft Board Institute. The program is implemented in the following way: Two rolls of corrugating medium are submitted on a weekly basis from the production of each machine. Each roll is evaluated for basis weight, caliper, Concora flat crush (conditioned after fluting), and runability, the latter being measured by corrugating each roll under standardized conditions into A-flute board at 600 feet per minute with minimum tension. If runability is unsatisfactory at this speed, the speed of the corrugator is reduced by increments of 25 f.p.m. until satisfactory runability is obtained as indicated by the absence of ruptured flutes. If the runability is satisfactory at 600 f.p.m. with minimum tension, the tension is increased by increments of 1/2 lb. per in. to determine the maximum tension at which satisfactory runability is obtained. The maximum tension used is 1-1/2 lb. per in. Flat crush tests are made on the single-faced board obtained at the maximum speed with minimum tension.

In addition to the evaluation carried out at the Institute as described above, each participant may, if he so desires, evaluate each roll of corrugating medium for Concora flat crush (conditioned after fluting) and submit the results to The Institute of Paper Chemistry, thus providing an opportunity to include a comparison of Institute and mill Concora flat crush results in the monthly progress reports.

The study, as described in the preceding paragraphs, provides several important benefits. For example, it enables each participant to evaluate his quality position in relation to the rest of the industry on a continuing basis. In addition, it provides a basis for comparing Concora flat crush results obtained at the Institute with those obtained at the mills on corresponding rolls of medium. This type of comparison is a helpful adjunct to conventional calibration procedures. Another benefit is provided by virtue of the fact that the study is accumulating an ever-growing reserve of background information essential for the judicious interpretation of any proposed specifications on corrugating medium whether on a company or industry basis.

During the month of May, 128 rolls of corrugating medium were submitted to The Institute of Paper Chemistry from the production of twenty machines.

Shown below are the maximum and minimum current machine averages for each test (the current machine average is the average of the results obtained on all rolls submitted from a given machine during the current period); also given for each test is the current F.K.I. average which is determined by averaging the current machine averages for the previous twelve months (exclusive of the current period) and is indicative of the test level being maintained by the industry as a whole to the extent that the industry is represented by the participating machines:

	Maximum Current Machine Average	Minimum Current Machine Average	Current F.K.I. Average
Basis weight, lb.	29.3	25.2	27.2
Caliper, pt.	11.3	9.2	10.2
Concora flat crush, p.s.i. (Conditioned after fluting)	40.2	31.2	36.4
Single-face flat crush, p.s.i.	36.1	29.3	32.7

The runability data for the 133 rolls of medium evaluated during

May are summarized as follows:

Runability	Number of Rolls	Percentage of Total Rolls
Less than 600 f.p.m. with minimum tension	8	6.2
600 f.p.m. with minimum tension	5	3.9
600 f.p.m. with tension of 1/2 lb. per in.	12	9.4
600 f.p.m. with tension of 1 lb. per in.	27	21.1
600 f.p.m. with tension of 1-1/2 lb. per in.	76	59.4

Concora flat crush results obtained on specimens conditioned after fluting were submitted for fourteen of the twenty machines from which rolls were received during the current month. The comparisons of Concora flat crush test results based on the average result obtained at the Institute and at the mill for all rolls compared for each machine are summarized below. Shown in this summary is the number of machines (and the percentage of the total machines which they represent) whose Concora test averages fall within the indicated percentage ranges from the results obtained at the Institute on the same rolls.

Average Percentage Difference Between Institute and Mill Concora Flat Crush Test Results ^a	Number of Machines	Percentage of All Machines
<u>± 1.0</u>	2	14.3
<u>± 2.5</u>	3	21.4
<u>± 5.0</u>	6	42.9
<u>± 7.5</u>	9	64.3
<u>±10.0</u>	12	85.7
<u>±10.5</u>	13	92.9
<u>±11.6</u>	14	100.0

^a The average obtained at the Institute was used as the reference in the calculation of the percentage differences.

CONTINUOUS EVALUATION OF CORRUGATING MEDIUM

PURPOSE OF THIS STUDY

The purpose of this study is to provide a continuous evaluation of the quality and runability of corrugating medium produced by members of the Fourdrinier Kraft Board Institute. The study, as it progresses, is accumulating a backlog of data and experience which provides several important benefits. For example, it enables each participant to evaluate his position in relation to the rest of the industry. In addition, it provides background information essential for the judicious interpretation of any proposed specifications on corrugating medium (on either a company or industry basis).

The program also provides a basis for comparing Concora results obtained at the Institute with those obtained at the mills on corresponding rolls of medium. This comparison is a helpful adjunct to conventional calibration procedures.

PROCEDURE FOR PARTICIPATING

The procedure for participating in this study involves the submission of two rolls of corrugating medium per week from each machine to The Institute of Paper Chemistry. These rolls are taken from regular production runs on different days. Each roll is 10 to 12 inches wide and contains approximately 5,000 lineal feet of medium (approximately 30 inches in diameter). When received by the Institute, each roll is assigned a code letter and number. The rolls are numbered in the sequence in which they are received. Code letters are assigned on the basis of machines, and a given machine is assigned a

different code letter each month in order to mask the identity of the mills. For purposes of reference, an outline of this program which describes the necessary instructions for sampling was appended to Progress Report One in this series.

PRESENTATION AND DISCUSSION OF TEST RESULTS OBTAINED AT
THE INSTITUTE OF PAPER CHEMISTRY

During the month of May one hundred and twenty-eight rolls of corrugating medium were selected from the production of twenty machines and submitted to The Institute of Paper Chemistry for evaluation. A tabulation of the number of rolls submitted from each machine is given in Table I.

Each sample of corrugating medium was evaluated for basis weight, caliper, Concora flat crush (conditioned after fluting), H. and D. flat crush (single-faced board), and runability. (Concora flat crush results obtained on specimens tested immediately after fluting were included in Progress Reports 45 through 57). Runability was measured by corrugating each roll under standardized conditions on the Institute's corrugator into A-flute board at 600 feet per minute with minimum tension. If unsatisfactory runability occurred at this speed, the corrugator was slowed down in increments of 25 f.p.m. until satisfactory runability was obtained (no ruptured flutes). If the medium fabricated satisfactorily at 600 f.p.m. with minimum tension, further runs were made at higher tensions to determine when cracking occurred. The higher tensions used were 0.5 lb. per inch, 1.0 lb. per inch, and 1.5 lb. per inch.

TABLE I

NUMBER OF ROLLS OF CORRUGATING MEDIUM SUBMITTED
FOR EVALUATION FROM EACH MACHINE

Machine Code	Number of Rolls
A	6
B	6
C	8
D	6
E	4
F	3
G	8
H	4
I	8
J	6
K	9
L	4
M	1
N	9
O	6
P	8
Q	13
R	9
S	5
T	5
Total	128

Flat crush was determined on the board obtained at a speed of 600 f.p.m. with minimum tension. In addition to information about quality, these results will provide data which may be useful in studying the relationship between Concora flat crush and combined board flat crush for each participant's medium.

As requested by members of the F.K.B.I., the Concora medium test results are calculated on the basis of pounds of load per unit area rather than on the basis of the formula suggested by the Concora manufacturer and are reported as Concora flat crush test results. In Progress Reports One and Two, the Concora medium test results were reported on the basis of the formula suggested by the Concora manufacturer.

The average test results obtained on the rolls of corrugating medium submitted by each participant (current machine averages) are shown in Table II and graphically presented in Figures 1 to 4. In addition to a comparison of the test data obtained for the various machines, Table II also presents the current F.K.I. averages, cumulative F.K.I. averages, and the F.K.I. indexes. The current F.K.I. average is the average of test results for all machines participating in the study during the current month. The cumulative F.K.I. average is based on the results for the previous twelve-month period excluding the result for the current period. The F.K.I. index is obtained as follows:

$$\frac{\text{current F.K.I. average}}{\text{cumulative F.K.I. average}} \times 100 = \text{F.K.I. index (\%)}$$

The F.K.I. index provides a ready means of comparing the current quality with previous results. An index greater than 100% indicates that current quality is higher than the average result for the previous twelve periods; an index below 100% indicates that current quality is lower than the average result for the previous twelve periods.

TABLE II

SUMMARY OF CURRENT MACHINE AVERAGES

May, 1960

Code	Basis Weight, lb.	Caliper, points	Concora Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.
A	27.1	9.5	38.1	33.1
B	27.5	9.2	33.2	29.4
C	27.7	10.3	39.2	35.4
D	29.3	9.6	35.4	31.9
E	27.4	11.3	33.7	30.4
F	25.7	10.2	39.2	No data ^a
G	26.8	10.4	34.8	31.5
H	27.4	10.2	38.6	33.4
I	27.4	10.3	38.6	35.3
J	28.2	10.0	34.9	30.7
K	26.8	10.2	37.1	34.5
L	27.1	9.3	36.7	32.9
M	25.2	10.1	31.2	29.3
N	27.3	10.1	38.4	34.5
O	26.9	9.8	33.8	31.1
P	27.8	10.2	40.2	35.4
Q	27.1	10.8	34.8	32.0
R	28.3	10.6	37.1	32.7
S	26.8	10.9	38.7	36.1
T	26.8	10.4	35.1	32.2
Current F.K.I. Average	27.2	10.2	36.4	32.7
Cumulative F.K.I. Average	27.3	10.2	36.7	33.0
F.K.I. Index, %	99.9	100.0	99.4	99.2

^a See Table VIII.

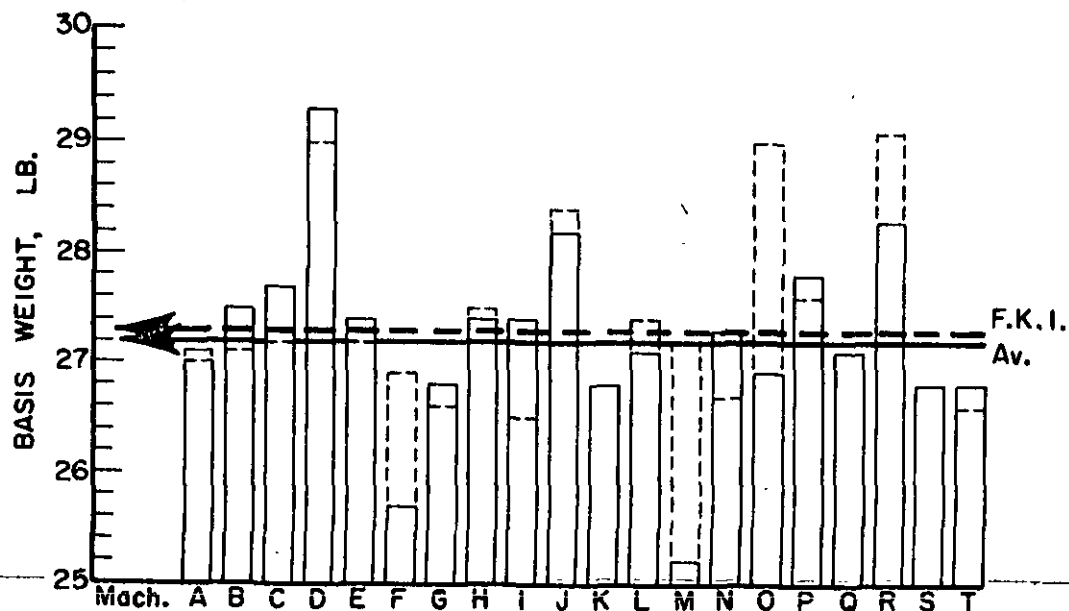


Figure 1

Comparison of Basis Weight Results for May, 1960

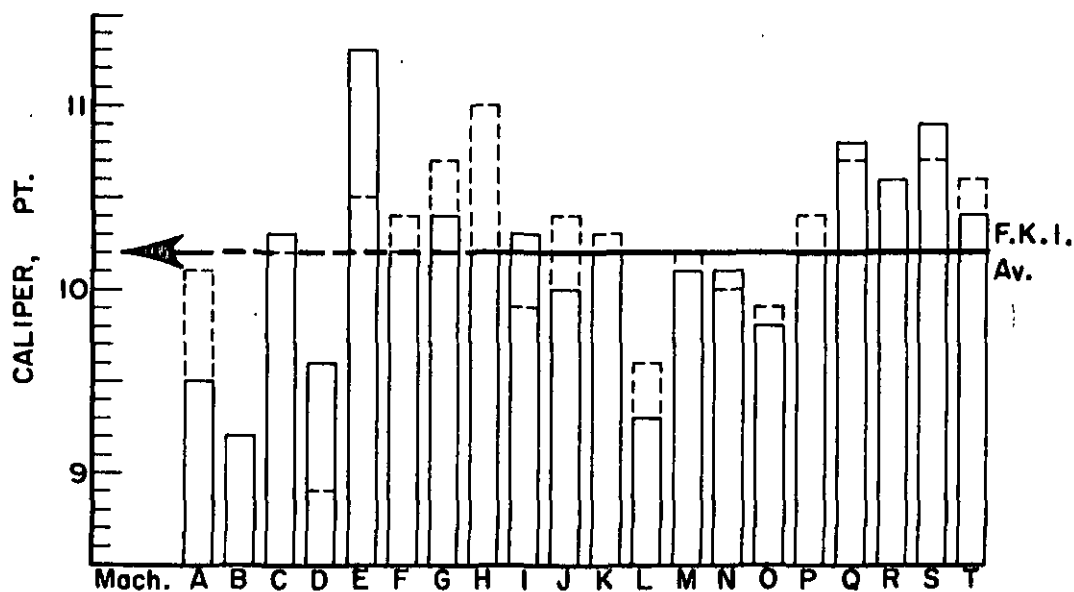


Figure 2

Comparison of Caliper Results for May, 1960

— Current machine average
- - - Cumulative machine average

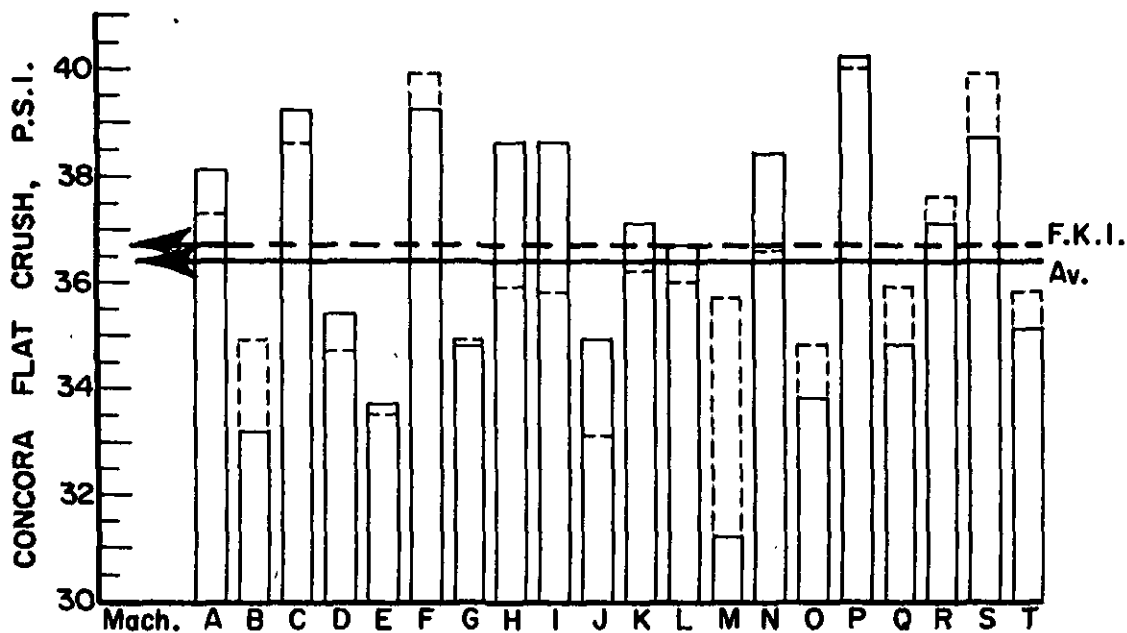


Figure 3

Comparison of Concora Flat Crush Results for May, 1960

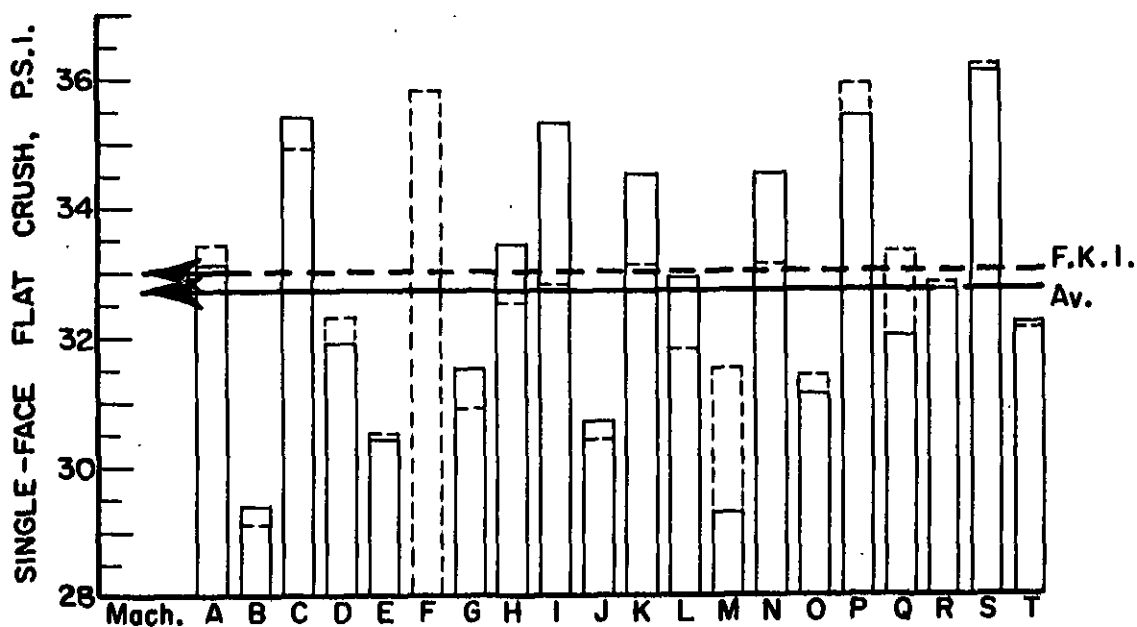


Figure 4

Comparison of Single-Face Flat Crush Results for May, 1960

— Current machine average
- - - Cumulative machine average

In Table II the current machine averages for the month of May are summarized. It may be noted in Table I and Figure 1 that basis weight varied from a low of 25.2 lb. for Machine M to a high of 29.3 lb. for Machine D. The current F.K.I. average for basis weight was 27.2 lb., which was slightly lower than the cumulative F.K.I. average of 27.3 lb. Of the current machine averages shown in Table II, two were below the 26-lb. minimum requirement of Rule 41. On the basis of individual rolls, it may be noted that the tabulated data for each machine shown in Tables III through XXII included four basis weight averages which were below 26 lb.

With regard to the caliper results for the current period, it may be seen in Table II and also in Figure 2 that the lowest current machine average of 9.2 points was associated with Machine B and the highest average of 11.3 points was associated with Machine E. The current F.K.I. average of 10.2 points was the same as the cumulative F.K.I. average. The minimum caliper requirement of nine points specified in Rule 41 was met by all participants on the basis of the current machine averages shown in Table II. On the basis of individual rolls, there were two caliper averages below 9 points.

The Concora flat crush averages are presented graphically in Figure 3 based on the data in Table II. An inspection of these results reveals that 40.2 p.s.i. was the highest average and 31.2 p.s.i. the lowest. Machine P had the highest average whereas Machine M had the lowest average. The current F.K.I. average of 36.4 p.s.i. was slightly lower than the cumulative F.K.I. average of 36.7 p.s.i.

The highest single-face flat crush average of 36.1 p.s.i. was obtained on the medium from Machine S and the lowest of 29.3 p.s.i. on the medium from Machine M. These data are shown in Table II and are presented graphically in Figure 4. The current F.K.I. average was 32.7 p.s.i., whereas the cumulative F.K.I. average was 33.0 p.s.i.

The runability data for the 128 rolls of medium evaluated during May are summarized as follows:

Runability	Number of Rolls	Percentage of Total Rolls
Less than 600 f.p.m. with minimum tension	8	6.2
600 f.p.m. with minimum tension	5	3.9
600 f.p.m. with tension of 1/2 lb. per in.	12	9.4
600 f.p.m. with tension of 1 lb. per in.	27	21.1
600 f.p.m. with tension of 1-1/2 lb. per in.	76	59.4

For the current period, the current F.K.I. average for caliper was the same as the cumulative F.K.I. average, and the current F.K.I. averages for basis weight, Concora flat crush, and single-face flat crush were slightly lower than their respective cumulative F.K.I. averages.

The test results obtained on the sample lots submitted from the production of each of the machines are shown in Tables III through XXII for Machines A through T, respectively. The maximum, minimum, and average test results obtained on each sample lot are shown for all tests except basis weight for which only the average is shown; in addition, the over-all average result for all sample lots submitted from a given machine is shown

for each test. The latter over-all averages are reported as "current machine averages." A cumulative machine average is also shown and is calculated by averaging the current machine averages for the previous twelve periods (excluding the current period). Also shown for each machine in Tables III to XXII are the machine factor and machine index which are defined as follows:

$$\frac{\text{current machine average}}{\text{cumulative machine average}} \times 100 = \text{machine factor (\%)}$$

$$\frac{\text{current machine average}}{\text{cumulative F.K.I. average}} \times 100 = \text{machine index (\%)}$$

The machine factor and machine index provide a means for comparing the current machine average with either the previous results for that particular machine or with the cumulative results for all machines--i.e., the cumulative F.K.I. average.

TABLE III

SUMMARY OF TEST RESULTS FOR MACHINE A
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
A-1	4-16-60	5-10-60	364	27.1	9.3 8.9	39.6 33.6	34.6 32.0	Note a
A-2	4-19-60	5-10-60	365	27.1	9.1 8.5	42.0 34.8	33.0 29.6	Note b
A-3	4-21-60	5-10-60	366	27.3	9.2 8.9	42.0 39.6	36.6 33.2	1-1/2
A-4	5-1-60	5-9-60	367	26.2	10.5 9.8	37.8 33.0	30.8 28.2	Note c
A-5	5-2-60	5-10-60	368	27.4	10.2 9.3	41.4 37.8	36.6 34.4	1
A-6	5-5-60	5-10-60	369	27.4	10.2 9.9	40.8 36.6	34.6 32.8	1
Current Machine Average								
				27.1	9.5	38.1	33.1	
Cumulative Machine Average				27.0	10.1	37.3	33.4	
Machine Factor, %				100.3	94.2	102.2	99.1	
Machine Index, %				99.3	93.1	104.1	100.2	

TABLE IV

SUMMARY OF TEST RESULTS FOR MACHINE B
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
B-1	4-15-60	5-13-60	13	27.9	10.0 9.1	34.2 30.0	29.2 28.4	Note a
B-2	4-15-60	5-13-60	14	28.3	9.9 8.8	34.2 30.0	29.6 28.2	1-1/2
B-3	4-15-60	5-13-60	15	26.9	9.6 8.5	36.6 30.6	33.1 28.8	1-1/2
B-4	4-15-60	5-13-60	16	27.1	9.5 8.8	35.4 31.8	30.6 26.2	1-1/2
B-5	4-16-60	5-19-60	17	27.4	9.8 8.9	34.8 32.4	31.2 30.2	1-1/2
B-6	4-16-60	5-19-60	18	27.6	9.4 8.6	36.0 33.0	29.8 27.6	1-1/2
Current Machine Average								
				27.5	9.2	33.2	29.4	
Cumulative Machine Average				27.1	9.2	34.9	29.1	
Machine Factor, %				101.6	100.0	95.1	100.8	
Machine Index, %				101.0	90.3	90.5	89.0	

a Maximum speed at which this medium could be corrugated with minimum tension was 575 f.p.m.

b Maximum speed at which this medium could be corrugated with minimum tension was 375 f.p.m.

c Maximum speed at which this medium could be corrugated with minimum tension was 400 f.p.m.

TABLE V
SUMMARY OF TEST RESULTS FOR MACHINE C
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concora Flat Crush, p.s.i.		Single-Face Flat Crush, p.s.i.		Runability, Maximum Tension at 600 f.p.m., lb./in.	
					Max.	Min.	Max.	Min.	Max.	Min.	Av.	Min.
C-1	4-20-60	4-27-60	--	27.9	10.8	10.2	42.0	39.0	37.0	34.4	35.6	Min.
C-2	4-23-60	4-27-60	--	28.2	10.9	10.1	41.4	37.8	38.4	36.4	37.3	Min.
C-3	4-27-60	5-6-60	--	27.3	10.4	9.8	37.8	34.8	34.0	31.4	33.1	1
C-4	4-30-60	5-6-60	--	27.9	10.5	10.3	42.6	37.8	37.8	33.2	35.1	1/2
C-5	5-5-60	5-11-60	--	27.0	10.9	10.1	42.0	38.4	37.0	34.0	35.3	1/2
C-6	5-7-60	5-11-60	--	27.9	10.9	10.1	42.0	37.2	36.2	33.2	35.0	1
C-7	5-11-60	5-19-60	--	28.0	10.7	10.1	39.0	37.2	38.4	34.4	36.5	1
C-8	5-14-60	5-19-60	--	27.4	10.2	9.9	40.2	36.6	36.6	33.6	34.9	1
Current Machine Average				27.7	10.3		39.2		35.4			
Cumulative Machine Average				27.2	10.2		38.6		34.9			
Machine Factor, %				101.7	101.3		101.5		101.2			
Machine Index, %				101.6	101.4		106.8		107.1			

TABLE VI
SUMMARY OF TEST RESULTS FOR MACHINE D
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concora Flat Crush, p.s.i.		Single-Face Flat Crush, p.s.i.		Runability, Maximum Tension at 600 f.p.m., lb./in.	
					Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
D-1	4-18-60	4-27-60	17	28.7	9.8	9.0	38.4	34.2	34.4	32.4	33.1	1-1/2
D-2	4-18-60	4-27-60	18	29.6	10.1	9.5	39.6	35.4	33.4	31.6	32.7	1-1/2
D-3	4-19-60	4-27-60	19	29.6	10.0	9.0	37.8	33.6	35.0	31.0	32.7	1-1/2
D-4	4-19-60	4-27-60	20	29.1	9.9	8.9	37.8	35.4	36.4	32.4	34.4	1-1/2
D-5	5-3-60	5-12-60	21	30.1	10.3	9.5	35.4	31.8	32.0	29.8	30.6	1-1/2
D-6	5-4-60	5-12-60	22	28.8	10.2	9.2	36.6	31.2	30.0	27.6	28.2	1-1/2
Current Machine Average												
				29.3			9.6					31.9
Cumulative Machine Averaged				29.0			8.9					32.3
Machine Factor, %				101.3			108.3					98.8
Machine Index, %				107.6			94.2					96.8

TABLE VII
SUMMARY OF TEST RESULTS FOR MACHINE E
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concora Flat Crush, p.s.i.		Single-Face Flat Crush, p.s.i.		Runability, Maximum Tension at 600 f.p.m., lb./in.	
					Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
E-1	4-21-60	4-27-60	297	28.6	12.2	11.5	37.8	32.4	36.2	33.0	34.3	1-1/2
E-2	4-21-60	4-27-60	298	26.7	11.8	11.0	33.6	31.2	27.2	26.2	26.6	1-1/2
E-3	5-4-60	5-12-60	305	27.1	11.1	10.2	36.0	33.0	31.6	28.6	30.4	1-1/2
E-4	5-4-60	5-12-60	306	27.3	11.3	11.0	33.0	30.6	31.8	29.0	30.5	1-1/2
Current Machine Average												
				27.4			11.3					30.4
Cumulative Machine Average				27.2			10.5					30.5
Machine Factor, %				100.7			107.5					99.7
Machine Index, %				100.6			110.9					92.2

^a Maximum speed at which this roll could be corrugated with minimum tension was 475 f.p.m.

TABLE VIII
SUMMARY OF TEST RESULTS FOR MACHINE F
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
F-1	4-11-60	4-29-60	336	25.5	10.8 10.0 10.2	43.8 38.4 40.8		Note a
F-2	4-13-60	4-29-60	425	26.5	10.3 9.9 10.1	42.6 39.6 41.5		Note a
F-3	4-20-60	4-29-60	629	25.1	10.8 9.8 10.2	36.6 33.6 35.3		Note a
Current Machine Average								
				25.7	10.2	39.2		
Cumulative Machine Average				26.9	10.4	39.9		
Machine Factor, %				95.8	98.1	98.3	35.8	
Machine Index, %				94.4	99.6	106.9		

TABLE IX
SUMMARY OF TEST RESULTS FOR MACHINE G
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
G-1	4-20-60	4-27-60	44	26.7	10.9 9.9 10.4	34.8 30.6 33.0	27.0 30.0 30.0	1
G-2	4-25-60	5-2-60	45	26.8	10.3 9.5 9.8	39.6 37.2 38.2	31.8 33.6 33.6	1-1/2
G-3	4-26-60	5-2-60	46	27.0	11.3 10.5 10.9	36.6 33.0 34.9	30.0 31.1 31.1	1-1/2
G-4	5-4-60	5-16-60	47	27.4	11.0 9.8 10.1	40.2 36.0 38.3	32.0 33.6 33.6	1-1/2
G-5	5-5-60	5-16-60	48	26.8	12.1 11.1 11.5	37.8 32.4 34.6	31.4 31.8 31.8	1-1/2
G-6	5-10-60	5-16-60	49	26.9	10.2 9.5 10.0	37.8 34.2 35.0	32.4 32.8 32.8	1-1/2
G-7	5-16-60	5-25-60	50	26.3	10.8 9.8 10.4	34.2 31.8 33.1	29.8 30.8 30.8	1-1/2
G-8	5-17-60	5-25-60	51	26.7	10.6 9.8 10.2	34.2 28.2 31.7	27.4 28.3 28.3	1-1/2
Current Machine Average				26.8	10.4	34.8	31.5	
Cumulative Machine Average				26.6	10.7	34.9	30.9	
Machine Factor, %				100.8	97.3	99.9	101.9	
Machine Index, %				98.4	102.3	95.1	95.4	

^a Single-face flat crush could not be determined because the medium fractured even at a speed of 100 f.p.m.

TABLE X
SUMMARY OF TEST RESULTS FOR MACHINE H
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concora Flat Crush, p.s.i.		Single-Face Flat Crush, p.s.i.		Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Max.	Min.	Max.	Min.	Max.
H-1	4-29-60	5-3-60	303	28.0	11.0	10.5	10.6	36.0	36.2	33.6	34.5
H-2	4-29-60	5-3-60	304	28.0	10.9	10.2	10.4	37.2	34.6	32.6	33.5
H-3	5-12-60	5-17-60	311	26.9	10.0	8.8	9.6	37.8	35.4	32.0	33.7
H-4	5-12-60	5-17-60	312	26.8	10.2	9.7	10.0	33.6	33.0	30.8	32.0
Current Machine Average											
				27.4			10.2		38.6		33.4
Cumulative Machine Average				27.5			11.0		35.9		32.5
Machine Factor, %				99.6			92.2		107.6		102.8
Machine Index, %				100.5			99.6		105.3		101.2

TABLE XI
SUMMARY OF TEST RESULTS FOR MACHINE I
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concora Flat Crush, p.s.i.		Single-Face Flat Crush, p.s.i.		Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Max.	Min.	Max.	Min.	Max.
I-1	4-18-60	4-27-60	--	26.7	10.2	9.8	10.0	37.8	36.4	33.4	34.7
I-2	4-21-60	4-27-60	--	27.9	10.5	10.1	10.3	42.0	37.8	35.6	36.4
I-3	4-26-60	5-6-60	--	27.5	10.5	10.0	10.2	37.8	39.5	35.6	35.1
I-4	4-28-60	5-6-60	--	27.6	10.8	10.3	10.6	41.4	39.6	35.0	34.0
I-5	5-2-60	5-11-60	--	27.6	10.3	10.0	10.1	40.2	39.4	38.2	36.5
I-6	5-4-60	5-11-60	--	27.6	11.1	10.4	10.8	38.4	37.2	34.8	34.4
I-7	5-9-60	5-19-60	--	27.6	10.6	10.0	10.2	40.2	37.2	36.4	36.8
I-8	5-12-60	5-19-60	--	26.9	10.6	9.9	10.2	40.2	38.5	33.6	34.6
Current Machine Average											
				27.4			10.3		33.6		35.3
Cumulative Machine Average				26.5			9.9		35.8		32.8
Machine Factor, %				103.4			104.1		107.9		107.8
Machine Index, %				100.6			101.2		105.3		107.0

TABLE XII
SUMMARY OF TEST RESULTS FOR MACHINE J
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, P.S.I.	Single-Face Flat Crush, P.S.I.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
J-1	4-12-60	4-27-60	17	27.9	10.0 9.0	37.8 30.6	32.4 31.2	1-1/2
J-2	4-13-60	4-27-60	18	27.9	10.0 9.0	36.0 33.0	32.0 29.4	1-1/2
J-3	4-21-60	5-12-60	19	28.7	10.9 10.0	35.4 31.8	28.0 27.2	1-1/2
J-4	4-22-60	5-12-60	20	28.7	11.1 10.1	37.2 35.4	32.6 30.4	1-1/2
J-5	5-2-60	5-12-60	21	27.9	10.8 9.8	37.8 34.2	32.2 30.4	1-1/2
J-6	5-3-60	5-12-60	22	27.8	10.0 9.2	38.4 33.6	32.6 29.4	1-1/2
Current Machine Average				28.2	10.0	34.9	30.7	
Cumulative Machine Average				28.4	10.4	33.1	30.4	
Machine Factor, %				99.1	96.9	105.6	100.9	
Machine Index, %				103.3	98.3	95.3	92.9	

TABLE XIII
SUMMARY OF TEST RESULTS FOR MACHINE K
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, P.S.I.	Single-Face Flat Crush, P.S.I.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
K-1	4-14-60	4-25-60	260	26.0	10.4 10.0	36.6 33.6	34.6 30.8	1-1/2
K-2	4-18-60	5-3-60	261	26.5	10.2 9.8	37.2 36.6	35.0 32.2	1-1/2
K-3	4-20-60	5-3-60	262	26.6	10.8 10.0	39.0 33.6	36.4 33.4	1-1/2
K-4	4-25-60	5-16-60	263	26.6	10.1 9.8	39.6 36.0	35.6 33.8	1-1/2
K-5	4-27-60	5-16-60	264	26.7	10.3 9.9	39.0 34.8	36.4 32.8	1-1/2
K-6	5-5-60	5-16-60	265	27.7	10.4 10.1	39.0 36.6	37.9 35.0	1-1/2
K-7	5-7-60	5-16-60	266	27.6	10.4 9.9	40.2 37.2	38.9 35.4	1-1/2
K-8	5-9-60	5-23-60	267	26.6	10.7 10.0	40.2 34.8	37.4 32.8	1-1/2
K-9	5-10-60	5-23-60	268	26.7	10.7 9.8	37.8 34.8	35.4 33.8	1-1/2
Current Machine Average				26.8	10.2	37.1	34.5	
Cumulative Machine Average				26.8	10.3	36.2	33.1	
Machine Factor, %				100.0	98.6	102.6	104.3	
Machine Index, %				98.2	99.5	101.3	104.6	

TABLE XIV
SUMMARY OF TEST RESULTS FOR MACHINE L
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concora Flat Crush, p.s.i.		Single-Face Flat Crush, p.s.i.		Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max.	Min.	Max.	Min.	Max.	Min.	
L-1	4-30-60	5-9-60	301	27.1	9.1	8.4	40.2	37.8	37.4	34.4	36.0
L-2	4-30-60	5-9-60	302	27.4	9.3	8.9	43.2	36.6	37.6	35.8	36.9
L-3	5-11-60	5-19-60	309	27.1	9.9	9.2	36.6	33.0	30.4	28.4	29.5
L-4	5-11-60	5-19-60	310	26.9	10.1	9.2	33.6	32.4	31.4	28.0	29.3
Current Machine Average											
Cumulative Machine Average				27.1	9.3		36.7		32.9		1-1/2
Machine Factor, %				27.4	9.6		36.0		31.8		
Machine Index, %				98.8	96.7		102.0		103.7		
				99.5	90.8		100.2		99.8		

TABLE XV
SUMMARY OF TEST RESULTS FOR MACHINE M
May, 1960

M-1	5- 4-60	5-18-60	E-4	25.2	10.4	9.8	10.1	33.0	29.4	31.2	29.8	28.6	29.3	1-1/2
Current Machine Average														
				25.2			10.1			31.2			29.3	
Cumulative Machine Average				27.2			10.2			35.7			31.5	
Machine Factor, %				92.7			99.5			87.4			93.0	
Machine Index, %				92.4			99.1			85.1			88.8	

TABLE XVI
SUMMARY OF TEST RESULTS FOR MACHINE N
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concra Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	Min. 1/2 1 1/2 1/2 1/2 1-1/2 1
N-1	4-19-60	4-27-60	--	27.1	10.3 9.8	42.0 36.0	35.2 34.0	34.7
N-2	4-22-60	4-27-60	--	27.4	10.5 9.9	40.8 36.0	34.6 33.0	33.8
N-3	4-25-60	5-6-60	--	27.8	10.5 9.5	40.8 39.0	34.4 32.8	33.7
N-4	4-28-60	5-6-60	--	27.8	10.8 9.9	40.8 36.0	35.0 33.0	34.2
N-5	4-29-60	5-6-60	--	27.4	10.4 9.8	42.0 38.4	36.6 35.6	36.4
N-6	5-3-60	5-11-60	--	26.8	10.4 9.9	36.0 33.6	32.6 31.6	32.0
N-7	5-6-60	5-11-60	--	27.9	10.8 10.2	42.0 38.4	39.0 34.8	36.4
N-8	5-10-60	5-19-60	--	27.3	10.2 9.8	40.2 36.0	37.0 35.6	36.2
N-9	5-13-60	5-19-60	--	26.6	10.2 9.7	37.8 34.8	34.0 32.4	33.2
Current Machine Average				27.3	10.1		38.4	34.5
Cumulative Machine Average				26.7	10.0		36.6	33.1
Machine Factor, %				102.3	100.6		104.9	104.1
Machine Index, %				100.3	98.8		104.7	104.5

TABLE XVII
SUMMARY OF TEST RESULTS FOR MACHINE O
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, P.S.I.	Single-Face Flat Crush, P.S.I.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
0-1	4-19-60	4-28-60	35	27.3	10.2 9.2	37.2	31.8	31.8
0-2	4-20-60	4-28-60	36	27.6	10.7 9.9	37.8	34.6	31.6
0-3	4-26-60	5-4-60	37	26.5	10.0 8.6	37.2	33.0	31.0
0-4	4-28-60	5-4-60	38	27.9	10.3 9.5	36.0	33.6	30.9
0-5	5-4-60	5-10-60	39	26.4	10.2 9.7	31.8	33.4	29.5
0-6	5-10-60	5-19-60	40	25.4	9.2 8.7	34.2	31.1	31.8
Current Machine Average								
				26.9	9.8	33.8	34.8	31.1
Cumulative Machine Average				29.0	9.9	34.8	34.8	31.4
Machine Factor, %				92.7	98.8	97.0	98.9	98.5
Machine Index, %				98.5	95.7	92.1	94.2	94.2

TABLE XVIII
SUMMARY OF TEST RESULTS FOR MACHINE P
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, P.S.I.	Single-Face Flat Crush, P.S.I.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
P-1	4-12-60	5-3-60	395	27.1	10.5 9.4	43.2	40.3	34.5
P-2	4-20-60	5-3-60	396	27.5	10.7 9.7	40.2	38.5	34.9
P-3	4-22-60	5-4-60	397	28.0	10.9 10.3	43.8	41.2	36.2
P-4	4-26-60	5-4-60	398	28.0	11.0 10.3	43.8	42.4	37.0
P-5	4-29-60	5-13-60	399	28.3	10.9 10.2	40.2	38.4	34.9
P-6	5-3-60	5-13-60	400	28.2	10.7 9.9	42.0	40.9	35.8
P-7	5-5-60	5-17-60	401	28.2	10.4 10.0	45.0	42.1	35.7
P-8	5-10-60	5-25-60	402	27.5	10.6 9.8	39.0	37.6	34.1
Current Machine Average								
				27.8	10.2	40.2	40.2	35.4
Cumulative Machine Average				27.6	10.4	40.0	40.0	35.9
Machine Factor, %				100.8	98.8	100.5	100.5	98.5
Machine Index, %				102.1	100.2	109.6	109.6	107.2

TABLE XIX
SUMMARY OF TEST RESULTS FOR MACHINE Q^a

May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concore Flat Crush, P.S.I.		Single-Face Flat Crush, P.S.I.		Runability, Maximum Tension at 600 f.p.m., lb./in.	
					Max.	Min.	Max.	Min.	Max.	Min.		Av.
Q-1	3-23-60	4-27-60	3749	28.2	11.2	11.0	33.6	31.2	33.8	31.2	32.4	1/2
Q-2	3-28-60	4-27-60	4558	27.8	11.0	10.3	37.8	34.2	36.0	35.0	35.4	1
Q-3	3-31-60	4-27-60	5006	26.3	11.7	10.8	34.2	31.8	28.4	27.0	27.8	Min.
Q-4	4- 5-60	5- 4-60	504	27.6	11.3	10.5	34.8	32.4	31.4	30.4	31.0	1
Q-5	4- 6-60	5- 4-60	636	27.6	11.0	10.6	37.8	36.0	33.2	31.4	32.3	1/2
Q-6	4-10-60	5- 4-60	1038	26.1	10.5	10.0	37.8	33.6	31.2	29.0	30.1	1
Q-7	4-14-60	5-23-60	1985	26.8	10.6	10.1	36.6	32.4	33.0	31.4	32.3	1
Q-8	4-21-60	5-23-60	2903	27.1	10.9	10.7	39.0	36.6	34.6	33.8	34.3	1-1/2
Q-9	4-28-60	5-23-60	4103	26.6	10.8	10.6	36.6	32.4	33.8	31.4	32.1	1-1/2
Q-10	4-30-60	5-23-60	4486	26.8	11.3	10.6	34.8	33.0	32.6	30.6	31.6	1
Q-11	5- 3-60	5-19-60	543	27.1	11.2	10.8	35.4	33.0	33.0	31.4	32.1	1
Q-12	5- 4-60	5-19-60	732	26.8	11.1	10.4	38.4	34.2	33.2	30.8	32.1	1
Q-13	5- 6-60	5-19-60	974	27.3	11.5	11.0	37.8	33.0	33.2	31.4	32.2	1
Current Machine Average				27.1					34.8			32.0
Cumulative Machine Average				27.1					35.9			33.3
Machine Factor, %				100.0					96.9			96.0
Machine Index, %				99.3					95.0			96.9

^a Some of the rolls from this company arrived too late for inclusion in last month's report.

TABLE XX
SUMMARY OF TEST RESULTS FOR MACHINE R
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points		Concora Flat Crush, p.s.i.		Single-Face Flat Crush, p.s.i.		Runability, Maximum Tension at 600 f.p.m., lb./in.	
					Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
R-1	4-20-60	5-3-60	327	29.5	11.0	10.4	40.2	37.2	35.2	31.4	33.8	1-1/2
R-2	4-21-60	5-3-60	328	29.5	11.2	10.2	40.8	36.6	35.4	32.8	33.8	1
R-3	4-27-60	5-3-60	329	27.3	10.6	9.7	40.2	34.2	32.4	29.2	31.0	1-1/2
R-4	4-29-60	5-12-60	330	28.1	11.1	10.2	39.0	34.8	32.6	30.6	31.9	1-1/2
R-5	5-5-60	5-12-60	331	27.4	11.0	10.1	37.2	33.6	33.6	31.0	32.3	1-1/2
R-6	5-6-60	5-12-60	332	29.0	11.5	10.7	40.8	36.0	34.6	32.2	33.6	1-1/2
R-7	5-11-60	5-25-60	333	27.0	10.2	9.8	37.2	31.8	32.4	30.2	30.9	1-1/2
R-8	5-13-60	5-25-60	334	28.5	10.8	10.1	38.4	36.0	34.4	32.0	32.7	1
R-9	5-18-60	5-25-60	335	28.3	10.8	10.2	38.4	34.8	36.2	32.6	34.5	1-1/2
Current Machine Average				28.3								
Cumulative Machine Average				29.1								
Machine Factor, %				97.2								
Machine Index, %				103.8								
					10.6				37.1		32.7	
					10.5				37.6		32.8	
					100.0				98.6		99.9	
					103.5				101.1		99.2	

TABLE XXI
SUMMARY OF TEST RESULTS FOR MACHINE S
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
S-1	5-3-60	5-9-60	561	26.3	11.1 10.2	40.2 34.8	35.2 33.0	33.8 1-1/2
S-2	5-5-60	5-10-60	562	26.6	11.3 10.4	43.8 39.6	39.6 36.6	38.0 1-1/2
S-3	5-10-60	5-16-60	563	27.2	11.5 10.4	43.2 35.4	37.0 34.6	35.9 1-1/2
S-4	5-19-60	5-24-60	564	27.1	11.3 10.8	42.6 34.2	38.4 36.0	36.8 1-1/2
S-5	5-19-60	5-24-60	565	26.7	12.0 10.4	42.6 32.4	37.6 34.6	36.1 1-1/2
Current Machine Average				26.8				
Cumulative Machine Average				26.8	10.9	38.7	36.1	36.1
Machine Factor, %				100.0	10.7	39.9	36.2	36.2
Machine Index, %				98.2	102.3	97.1	99.9	99.9
					107.1	105.7	109.4	109.4

TABLE XXII
SUMMARY OF TEST RESULTS FOR MACHINE T
May, 1960

Code	Date Made	Date Recd.	Mill Roll No.	Basis Weight, lb. per 1000 sq. ft.	Caliper, points	Concora Flat Crush, p.s.i.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
					Max. Min. Av.	Max. Min. Av.	Max. Min. Av.	
T-1	4-15-60	5-20-60	86	26.7	10.2 9.8	37.8 35.4	34.6 31.8	33.5 1-1/2
T-2	4-25-60	5-20-60	87	26.8	11.2 10.4	36.0 31.2	30.2 27.6	28.9 1
T-3	4-29-60	5-20-60	88	26.8	10.9 9.8	36.6 34.2	35.4 30.0	33.6 1
T-4	5-1-60	5-20-60	89	27.3	11.0 10.1	38.4 33.6	35.0 32.6	33.7 1-1/2
T-5	5-7-60	5-20-60	90	26.2	10.9 9.9	36.0 33.6	33.0 30.8	31.4 1
Current Machine Average				26.8				
Cumulative Machine Average				26.6	10.4	35.1	32.2	32.2
Machine Factor, %				100.6	10.6	35.8	32.1	32.1
Machine Index, %				98.2	98.1	98.0	100.5	100.5
					102.4	95.7	97.6	97.6

DISCUSSION OF CONCORA FLAT CRUSH TEST RESULTS OBTAINED AT THE
INSTITUTE OF PAPER CHEMISTRY AND THOSE OBTAINED AT THE MILLS

In Table XXIII a comparison of Institute and mill Concora flat crush test results obtained on conditioned specimens is given for the month of May. These comparisons were initiated in Progress Report 30 and permit interested participants to submit their Concora flat crush test results to The Institute of Paper Chemistry so that comparative results may be included in the monthly reports. Data sheets for supplying this information may be obtained from the Institute. Comparisons of this kind are a helpful adjunct to other calibration procedures. It may be noted in Table XXIII that fourteen of the twenty participating machines are included in this comparison of Concora flat crush data. Shown in Table XXIII are the Institute and mill Concora averages for each roll included in this comparison, the difference between the roll average based on Institute data and that based on mill data, the Institute and mill averages based on all rolls included in the comparison, and the difference between these over-all averages.

The Concora flat crush data shown in Table XXIII are summarized in Part I of Table XXIV where for each machine the following information is given: (1) Current machine average based on Institute data, (2) current machine average based on mill data, (3) the average differences--that is, the difference between the current machine average based on Institute data and that based on mill data and (4) the maximum difference encountered in comparing Institute and mill test averages for individual rolls. In Part II of Table XXIV the average difference of Part I has been converted to per cent by dividing it by the Institute average and multiplying the result by 100. The average differences in per cent

TABLE XXIII
INSTITUTE AND MILL CONCORDA FLAT CRUSH TEST RESULTS ON INDIVIDUAL ROLLS FOR MAY, 1960

Machine A				Machine B				Machine C			
Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a	Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a	Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a
A-1	364	4-16-60	42.6	B-1	13	4-15-60	32.0	C-1	—	4-20-60	40.7
A-2	365	4-19-60	40.6	B-2	14	4-15-60	31.9	C-2	—	4-23-60	39.6
A-3	366	4-21-60	42.1	B-3	15	4-15-60	33.1	C-3	—	4-27-60	37.0
A-4	367	5-1-60	39.6	B-4	16	4-15-60	33.6	C-4	—	4-30-60	40.6
				B-5	17	4-16-60	34.0	C-5	—	5-5-60	39.8
				B-6	18	4-16-60	34.3	C-6	—	5-7-60	39.2
Current Machine Av.			41.2	Current Machine Av.			33.2	C-7	—	5-11-60	38.0
								C-8	—	5-14-60	38.3
								Current Machine Av.			39.2
											36.6
											-2.6

Machine E				Machine F				Machine H			
Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a	Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a	Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a
E-1	297	4-21-60	35.5	F-1	336	4-11-60	40.8	H-1	303	4-29-60	39.5
E-2	298	4-21-60	32.4	F-2	425	4-13-60	41.5	H-2	304	4-29-60	38.9
E-3	305	5-4-60	34.8	F-3	629	4-20-60	35.3	H-3	311	5-12-60	38.7
E-4	306	5-4-60	32.2					H-4	312	5-12-60	37.3
Current Machine Av.			33.7	Current Machine Av.			39.2	Current Machine Av.			38.6
											41.4
											+2.8

Machine I				Machine K				Machine L			
Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a	Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a	Code	Roll No.	Date Made	Concorda Flat Crush, P.s.i. Difference ^a
I-1	—	4-18-60	36.4	K-1	260	4-14-60	35.5	L-1	301	4-30-60	38.8
I-2	—	4-21-60	39.7	K-2	261	4-18-60	36.7	L-2	302	4-30-60	40.2
I-3	—	4-26-60	39.5	K-3	262	4-20-60	36.2	L-3	309	5-11-60	34.8
I-4	—	4-28-60	39.6	K-4	263	4-25-60	37.6	L-4	310	5-11-60	33.1
I-5	—	5-2-60	39.4	K-5	264	4-27-60	37.3				
I-6	—	5-4-60	37.2	K-6	265	5-5-60	37.9				
I-7	—	5-9-60	38.6	K-7	266	5-7-60	38.9				
I-8	—	5-12-60	38.5	K-8	267	5-9-60	37.4				
Current Machine Av.			38.6	K-9	268	5-10-60	36.5	Current Machine Av.			36.7
				Current Machine Av.			37.1				39.6
											+2.9

^a This difference is the amount in p.s.i. units by which the mill result is higher or lower than the Institute result.

TABLE XXIII (Continued)
INSTITUTE AND MILL CONCORDIA FLAT CRUSH TEST RESULTS ON INDIVIDUAL ROLLS FOR MAY, 1960

Machine N				Machine P				Machine Q			
Mill Roll Code	Date Made	Concordia Insti- tute	Flat Crush, p.s.i. Differ- ence a	Mill Roll Code	Date Made	Concordia Insti- tute	Flat Crush, p.s.i. Differ- ence a	Mill Roll Code	Date Made	Concordia Insti- tute	Flat Crush, p.s.i. Differ- ence a
N-1	4-19-60	38.3	35.2	P-1	395	4-12-60	40.3	Q-1	3749	3-23-60	35.9
N-2	4-22-60	37.9	35.3	P-2	396	4-20-60	38.5	Q-2	4558	3-28-60	36.1
N-3	4-25-60	40.0	35.6	P-3	397	4-22-60	41.2	Q-3	5006	3-31-60	32.5
N-4	4-28-60	38.8	35.5	P-4	398	4-28-60	42.4	Q-4	504	4-5-60	33.5
N-5	4-29-60	40.4	35.9	P-5	399	4-29-60	38.4	Q-5	636	4-6-60	36.5
N-6	5-3-60	34.8	35.5	P-6	400	5-3-60	40.9	Q-6	1038	4-10-60	35.8
N-7	5-6-60	40.0	35.2	P-7	401	5-5-60	42.1	Q-7	1985	4-14-60	34.0
N-8	5-10-60	38.8	37.1	P-8	402	5-10-60	37.6	Q-8	2903	4-21-60	37.9
N-9	5-13-60	36.5	35.8					Q-9	4103	4-28-60	34.6
								Q-10	4486	4-30-60	34.1
								Q-11	543	5-3-60	34.2
								Q-12	732	5-4-60	35.8
								Q-13	974	5-6-60	35.3
Current Machine Av.		38.4	35.7	Current Machine Av.		40.2	40.2	Current Machine Av.		34.8	37.9

Machine S				Machine T			
Mill Roll Code	Date Made	Concordia Insti- tute	Flat Crush, p.s.i. Differ- ence a	Mill Roll Code	Date Made	Concordia Insti- tute	Flat Crush, p.s.i. Differ- ence a
S-1	5-3-60	38.3	40.8	T-1	86	4-15-60	36.2
S-2	5-5-60	40.9	44.5	T-2	87	4-25-60	33.5
S-3	5-10-60	38.0	42.8	T-3	88	4-29-60	35.0
S-4	5-19-60	38.8	43.9	T-4	89	5-1-60	36.1
S-5	5-19-60	37.7	43.9	T-5	90	5-7-60	34.6
Current Machine Av.		38.7	43.2	Current Machine Av.		35.1	38.8

a This difference is the amount in p.s.i. units by which the mill result is higher or lower than the Institute result.

for the current report and the two preceding reports are shown. It may be seen that, for the current period, the highest average difference of 11.6% was associated with Machine S and the lowest of 0.0% with Machine P. Differences greater than ten per cent were noted for Machines S and T. In the majority of comparisons, agreement between Institute and mill data was good, as evidenced by the following comparison of Institute and mill Concora flat crush results which shows the number of machines (and the cumulative percentage of all machines which this number represents) whose average Concora flat crush test results for the month of May fall within designated percentage ranges from the corresponding data obtained at the Institute:

Average Percentage Difference Between Institute and Mill Concora Flat Crush Test Results ^a	Number of Machines	Percentage of All Machines
± 1.0	2	14.3
± 2.5	3	21.4
± 5.0	6	42.9
± 7.5	9	64.3
± 10.0	12	85.7
± 10.5	13	92.9
± 11.6	14	100.0

^a The average obtained at the Institute was used as the reference in the calculation of the percentage differences.

TABLE XXIV

PART I: A COMPARATIVE SUMMARY FOR EACH MACHINE OF THE CONCORDA FLAT CRUSH AVERAGES BASED ON INSTITUTE DATA

AND THOSE BASED ON MILL DATA

Machine Code	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
Number of Rolls Compared	4	6	8	0	4	3	0	4	8	0	9	4	0	9	0	8	13	0	5	5
Concorda Flat Crush, p.s.i.	37.9	33.2	39.2	--	33.7	39.2	--	38.6	38.6	--	37.1	36.7	--	38.4	--	40.2	34.8	--	38.7	35.1
Current Machine Av. (Institute) ^a	41.2	32.4	36.6	--	33.8	37.9	--	41.4	37.4	--	38.3	39.6	--	35.7	--	40.2	37.9	--	43.2	38.8
Current Machine Av. (Mill) ^a	+3.3	-0.8	-2.6	--	+0.1	-1.3	--	+2.8	-1.2	--	+1.2	+2.9	--	-2.7	--	0.0	+3.1	--	+4.5	+3.7
Average Difference ^b	+6.2	-1.8	-5.4	--	-4.9	-3.6	--	+5.3	-2.6	--	+6.1	+4.5	--	-4.8	--	-1.7	+6.5	--	+6.2	+5.0
Maximum Difference ^c																				

PART II: A TABULATION FOR EACH MACHINE OF THE AVERAGE DIFFERENCE (PER CENT) BETWEEN THE CONCORDA FLAT CRUSH

AVERAGE BASED ON INSTITUTE DATA AND THAT BASED ON MILL DATA

Average Difference, % ^d	+8.7	-2.4	-6.6	--	+0.3	-3.3	--	+7.3	-3.1	--	+3.2	+7.9	--	-7.0	--	0.0	+8.9	--	+11.6	+10.5
Current Report (May)	+6.0	0.0	-4.3	--	+17.8	-6.4	--	+10.8	-3.1	--	+9.3	+5.7	--	-6.0	--	-1.0	+7.0	--	+5.1	+1.7
65th Report (April)	+9.5	-0.6	-1.3	--	+12.1	-5.0	--	+17.2	+0.3	--	+4.9	+4.9	--	-1.3	--	-1.8	+6.7	--	+4.9	--
63rd Report (March)																				

^a Comparisons based on current machine average include only those rolls for which mill data were submitted.

^b Average difference is the difference between the current machine average based on Institute test results and that based on mill test results with the Institute test results used as the reference. See Table XXIII.

^c Maximum difference is the greatest difference encountered in comparing Institute and mill test averages for individual rolls. See Table XXIII.

^d Average difference (per cent) is computed by dividing the average difference in p.s.i. (shown above in Part I of this table) by the Institute current machine average and multiplying the result by 100.

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